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Review Article

The Effectiveness of Exercise Therapy in the Treatment of Rotator Cuff Tendinopathy: A Systematic Review and Meta-Analysis

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Abstract: Shoulder discomfort is often brought on by rotator cuff tendinopathy. The purpose of this research is to assess the effectiveness of exercise-based treatment in treating rotator cuff tendinopathy, a condition characterized by shoulder discomfort and impaired function. Workplace employees with RC tendinopathy were eligible for inclusion in Randomized Controlled Trials (RCTs) so long as at least one of the therapies studied included exercise. The purpose of this study was to provide a workable approach to contrasting the efficacy of eccentric and concentric workouts for rotator cuff tendinopathy. To treat employees with RC tendinopathy and encourage their return to work, therapy activities administered in a clinical context have a low to moderate level of evidence. The statistical analysis showed that post-treatment and at the 4-week follow-up, radial shockwave therapy was superior to the ultrasound therapy for the treatment of rotator cuff tendinopathy. Specific shoulder exercises for the treatment of rotator cuff tendinopathy have not been the subject of many large-scale investigations. Most of those that do exist use a broad variety of exercises over varying time frames, with no uniformity between them in terms of the precise exercises employed or the number of times each exercise is performed.
Keywords: Effectiveness, Exercise, Therapy, Rotator Cuff, Tendinopathy.

Introduction

Rotator cuff tendinopathy occurs when the rotator cuff tissues are overworked, causing discomfort and weakness during activities like externally rotating and raising the shoulder[1]. Extrinsic and intrinsic processes, as well as environmental variables, all play a role in the patho-etiology of rotator cuff tendinopathy. Due to the heterogeneous nature of the variables contributing to rotator cuff tendinopathy, a variety of therapeutic approaches are necessary to address the condition[2]. The shoulder girdle connects the upper limbs to the trunk and is made up of the shoulder joint, which is a functional complex composed of bones, muscles, cartilage, tendons, capsules, bursa, and ligaments. One of its roles is to provide the upper limb with a wide range of motion (up to 180 degrees), allowing for a wide variety of motions such flexion, extension, internal rotation, and external rotation[3]. The tendons, which join muscle to bone and allow for stability, mobility, and force transmission, are one of the anatomical components that make up the shoulder complex and have a morphology rich in connective tissue.

Pain, morphological changes, and the inability to participate in sports and/or perform activities of daily living are the hallmarks of tendinopathies, which are characterized by injuries without rupture caused by overload, work-related repetitive strain injury, or metabolic alterations such as diabetes affecting one or more tendons. Shoulder discomfort is often brought on by rotator cuff tendinopathy. The purpose of this study is to assess the effectiveness of MT in treating rotator cuff (RC) tendinopathy. Since rotator cuff tendinopathy is so widespread, physical therapists often employ MT as a treatment option[4]. However, there is conflicting data on whether or not MT really works. To find RCTs that compared MT to other interventions for RC tendinopathy, we searched for articles containing keywords relating to the shoulder, RC tendinopathy, and MT across 4 databases. The Cochrane risk-of-bias tool was used to evaluate randomized controlled studies. Evidence was synthesized either quantitatively or qualitatively (via meta-analyses). Twenty-one studies met the criteria. The potential for prejudice in the majority was substantial. The risk of bias was considered to be just moderate to low in only 5 of the investigations[5]. With a mean difference of 1.1 (95% confidence interval: 0.6, 1.6) on a 10-cm visual analog scale, the overall effect for pain reduction of MT compared with a placebo or in addition to another intervention was statistically significant (n = 406), but

may or may not be clinically important. It is unclear if the therapeutic significance of the pain reduction shown when adding MT to an exercise program (n = 226) is warranted[6]. Qualitative studies have been unable to definitively determine if MT alone or in combination with an exercise regimen improves function. Low to intermediate quality data suggests that MT may reduce discomfort for people with RC tendinopathy, but whether or not it can also enhance function is unknown. More research with solid methodologies is required before any firm conclusions can be drawn.

Basis of Rotator Cuff Tendinopathy

Although the exact cause of RC tendinopathy is still up for debate, it is now believed to occur when stresses are applied to the tendon that are greater than the cells' ability to recover[7]. Extrinsic variables such as anatomical/biomechanical issues, capsule tightness, muscular strength deficits, aberrant scapular kinematics, and posture, and intrinsic factors such as age, vascularization, genetic components. Possible causes of RC tendinopathy include the aforementioned factors[8]. Both the cellular population of the tendon and the extracellular matrix undergo biochemical changes with the progression of RC tendinopathy. Common alterations include an uptick in the ratio of type III to type I collagen as well as an increase in the number of elongated tenocytes, a reduction in the thickness of collagen fibers, hyaline degeneration, chondroid metaplasia, fatty infiltrations, and a proliferation of fatty cells. In chronic tendon diseases, inflammatory cells seem to be few or nonexistent[9].

Rotator Cuff Tendinopathy Causes

Tendons and ligaments weaken and take longer to heal with age. Tendinopathy of the rotator cuff is more common when:

- ✓ Overuse of the arms, particularly in overhead motions,
- ✓ Insufficient recovery time for the rotator cuff muscles,
- ✓ Poor posture, and injury may all lead to shoulder pain.

Extrinsic Mechanisms of Rotator Cuff Tendinopathy

Bursal-sided RC tendon compression due to constriction of the sub acromial space is an extrinsic mechanism of RC tendinopathy caused by anatomical causes, biomechanical factors, or a combination of the two[10]. Coracoacromial arch, anterior acromion, and humeral head are the anatomical landmarks that define the subacromial space. Several imaging modalities, including MRI, US, and X-ray, have been used to examine Patients with RC tendon rips have a decreased AHD, which is typically between 7 and 14 mm in healthy shoulders. In addition, a decrease in AHD below 7 mm with the arm at rest is associated with a worse surgical result[11]. Sub acromial gap narrowing with the arm at rest is often impaired in individuals with RC tendinopathy, however this is not always the case. To identify impairments caused by biomechanical variables that "functionally" limit the subacromial space, only measurements done with muscle activation are effective.

Anatomical factors

Variations in the acromion's shape, the acromion's slope/angle, or prominent osseous changes characterized the acromion's morphologic state as a Type I (flat), Type II (curved), or Type III (hooked) acromion as an extrinsic mechanism of RC tendinopathy.

Biomechanical factors

Abnormal scapular and humeral kinematics, postural abnormalities, rotator cuff and scapular muscle performance impairments, and poor extensibility of pectoralis minor or posterior shoulder tissues may all contribute to extrinsic mechanical RC tendon compression. Superior translation of the humeral head or aberrant scapular motion that causes the acromion to move inferiorly can compress the rotator cuff tendon[12]. External processes such as poor posture, muscular weakness, and soft tissue tension may have a significant impact on scapular and humeral kinematics.

Exercise Therapy's Effectiveness in Treating Rotator Cuff Tendinopathy in Workers

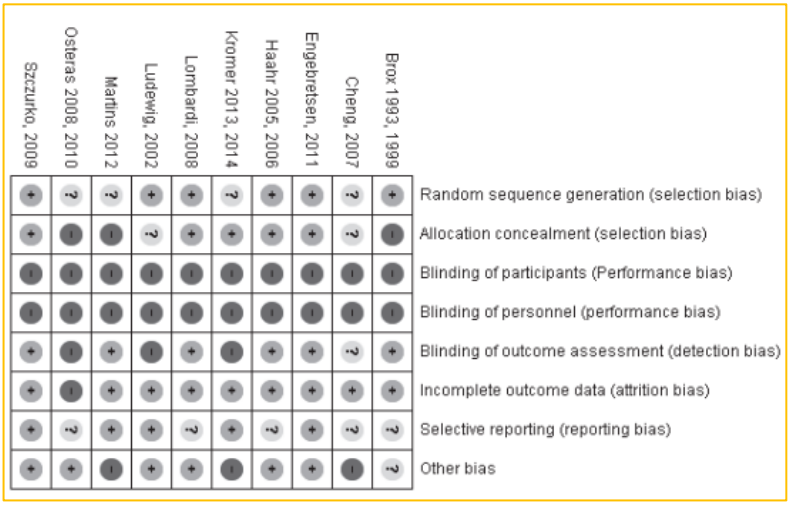
Following initial screening of titles and abstracts, 14 papers (10 studies) were selected for full-text evaluation (Table 1). Short-and long-term outcomes from the same cohort of participants were reported, therefore these findings were combined for analysis[13].

The Methodological Quality of the Research Includes

Overall, the methodological quality of the included research was scored at 0.91 (95% CI: 0.67 to 0.98), indicating that reviewers generally agreed on their assessment of the likelihood of bias across investigations.

There was fair to high agreement (κ=0.44 to 1.0) between the raters before consensus was reached on the risk of bias scale's individual items[14]. The overall indication for the methodological quality of the included studies was low to moderate (Table 1), with a mean score of 54.4%±17.2. Two randomized controlled trials were found to have the best quality of methodology, each scoring 75%. Table 1 show that none of the studies provided all of the necessary details to meet the rated methodological requirements. This was especially true with regards to whether or not participants and providers were blinded[15]. However, acceptable reporting of blinding of outcome assessors was present in six trials. The production of allocation sequences was documented by all but four research, while the method for concealing allocations was provided by just five. Five studies were evaluated as "unclear" due to selective result reporting since authors did not originally reveal their procedure. Two studies had a "high" risk of bias, and two had an "unclear" other risk of bias.

Table 1. The risk of bias in the included research



Treatment of Rotator Cuff Tendinopathy with Eccentric and Concentric Strengthening Activities

Patients in the control, concentric, and eccentric groups all had comparable mean ages at baseline. Unfortunately, random chance meant that the six men and five women weren't fairly distributed: 75% of the control group were males, 100% of the concentric group were men, and 100% of the eccentric group were women[16]. Table 2 displays the results. Due to the early availability of surgery as a consequence of the cancellations of other patients, two patients (CON002 and ECE001) did not make it through the full 8 weeks of the experiment. The findings and statistical analysis in both situations included the data gathered up to the 4-week period. There were no withdrawals from the study because of adverse events or patient choice. The results were double-checked by a medical statistician[17]. A separate one-way ANOVA was run (5% confidence interval) on the data on the assumption that it was parametric. Neither the OSS (Oxford Shoulder Score) nor the VAS showed any significant differences between the groups at the beginning, at 4 weeks, or at 8 weeks.

Table 2. Data from the raw results

Patient code	Oxford Shoulder Score			VAS			
	Start	4 weeks	8 weeks	Start	4 weeks	8 weeks	
CON001	28	29	27	49	43	34	
CON002	26	25	X	77	87	X	Surgery at week 6
CON003	25	28	28	35	44	46	
CON004	34	34	34	78	79	74	
CCE001	23	27	30	51	72	76	
CCE002	29	23	23	34	34	35	
CCE003	20	22	20	42	66	44	
ECE001	33	32	X	66	48	X	Surgery at week 7
ECE002	27	23	21	36	49	22	Cancelled surgery
ECE003	34	24	38	68	25	85	Cancelled surgery
ECE004	42	45	34	42	60	19	
ANOVA (p value)	0.083	0.428	0.443	0.443	0.465	0.890	
VAS: Visual Analogue Scale; CON: control group; CCE: concentric exercise group; ECE: eccentric exercise group; X: not recorded; ANOVA: analysis of variance.							

The self-reported exercise diary was used to assess the patients' compliance. 100 percent compliance was defined as doing 3 × 15 repetitions of the exercise every day for 8 weeks. This amounts to a total of 5040 repetitions[18]. Only five of the exercise group patients returned their journals. The average adherence of patients who filled out the exercise journal was 86%[19].

During the 6-month study period, only 14 patients who met all inclusion criteria were found. The study's 36 participants were selected after a review of the surgical waiting list over the prior 6 months. During the experiment, this was not the case owing to inevitable variations in caseload, and fewer participants were recruited than anticipated. This exemplifies the challenge of anticipating research recruitment rates, since previous data may not be indicative of present trends[20].

Patients with rotator cuff tendinopathy reported a significant decrease in pain and an increase in functionality and quality of life following shockwave therapy, both immediately following the therapeutic intervention and at the 4-week follow-up[21].

Shockwave treatment showed similar results in the present study with other studies in the literature about patients with rotator cuff tendinopathy, despite the fact that it is difficult to directly compare the outcomes from different studies due to the different shockwave devices used or the different dosage of energy flux employed in these studies, along with the different time periods used for the follow-ups. As a result, ESWT has been shown to be effective in the treatment of rotator cuff tendinopathy in a number of trials[22].

Shoulder function, as measured by the Constant Murley Scale (CMS), and discomfort, as measured by the Visual Analog Scale (VAS), both improved considerably at the 3- and 6-month follow-ups after ESWT, as reported. However, the high-energy ESWT had more noticeable outcomes[23]. Extracorporeal shockwave therapy has been studied extensively for the treatment of rotator cuff tendinopathy, however therapeutic ultrasound has been found to be effective in only a small number of investigations, and no research have compared shockwave therapy with ultrasound therapy for this condition[24].

Conclusion

Clinically administered therapy activities for employees with RC tendinopathy have a low to moderate level of evidence supporting their efficacy in reducing pain, increasing function, and facilitating a safe return to work. Exercise therapy should be explored initially for the treatment of RC tendinopathy since it is easy, cheap, and seems to favor return to work. It is unknown, however, whether or not additional therapies would be helpful, and what the best intensity and context for providing the therapeutic exercise program would be. Specific shoulder exercises for the treatment of rotator cuff tendinopathy have not been the subject of many large-scale investigations. None of them follow a uniform routine in terms of the sorts of exercises performed or the number of times each exercise is performed.

Multiple-exercise programs are the focus of each cited study. Since this is the case, it is difficult to say which of the exercises is the most useful. Extracorporeal shockwave therapy and therapeutic ultrasound were shown to be equally beneficial in reducing pain and enhancing shoulder function and quality of life in patients with rotator cuff tendinopathy, according to the findings of the current research. Extracorporeal Shock Wave Therapy (ESWT) was shown to have much better outcomes than ultrasound treatment.

Declarations

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